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EFFECTS OF VARYING RATES OF STIMULATION
ON THE ACTION OF THE RECURRENT LARYNGEAL NERVES.

Preliminary Communication from the Physiological Laboratory of the Harvard Medical School.

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IN a paper recently published in the "New York Medical Journal"* I gave the results of my observations regarding the effects on the glottis following electrical stimulation of the recurrent laryngeal nerves. My experience has taught me that when in unnarcotized or slightly narcotized dogs these nerves are stimulated with the feeblest current of electricity, the first effect noticeable is a vibratory movement of the vocal bands, followed immediately by a closure of the glottis as the strength of the current is increased.

Dr. F. Donaldson, Jr., † however, has arrived at different conclusions. He maintains that stimulation of the recurrent nerves with weak currents invariably produces an opening of the glottis.

I have been much interested in trying to find out how there could be two opinions on a question which was so purely a matter of fact and observation, and one so readily demonstrable. My experimental studies have been so numerous during the past few years that I have felt justified in believing that under normal conditions weak stimuli did *not* effect an opening of the glottis. I have also had no doubt that with time this subject would rest upon a firm and scientific basis, and that all divergent views would be satisfactorily explained.

In October last Professor Bowditch called the writer's attention to a paper in the "Centralblatt für Physiologie," September 3 and 17, 1887, Nos. 12 and 13, by N. Wedensky, entitled "Ueber die Ursachen des Ritter-Rollet'schen Phänomens am Fusse des Frosches." This observer re-

ports that with a slow rate of stimulation of the sciatic nerve in frogs flexion of the leg is produced, while with more rapid rates flexion gives place to extension.

When Professor Bowditch, in his article on "The Action of Sulphuric Ether on the Peripheral Nervous System,"* had pointed out that there was a striking resemblance between the action of ether on the nerves and muscles of the frog's leg and that which we had observed on the larynx, it seemed probable that Wedensky's results with varying rates of stimulation might also find a parallel in the behavior of the glottis on irritation of the recurrent nerves in the same way. From my researches in this direction, which are at present under way, I feel inclined to suspect that the reason that other observers have obtained dilatation with feeble currents is to be found in the slow rate of vibration of the interrupters they have employed. In other words, the *rate of stimulation* is an important factor in determining the results of stimulating the recurrent laryngeal nerves.

I propose to pursue this subject, and to study the effects of varying rates of stimulation upon animals under the influence of different narcotics. As yet I have experimented only on chloralized dogs. The results have been so marked and constant as to warrant the following summary:

1. Slow rates of stimulation (18 to 28 a second) with weak currents produce opening. By increasing the rates (30 to 40 a second), the intensity remaining the same, closing is called forth.
2. Strong currents with slow rates produce closing.
3. Rapid rates with weak or strong currents produce closing.

* "The Anatomy and Physiology of the Recurrent Laryngeal Nerves," "N. Y. Med. Jour.," July 9, 16, 23, and August 6, 1887.

† "New York Med. Journal," Aug. 6, 13, 1887.

* "American Jour. of the Med. Sciences," April, 1887.

